

THE HISTORY AND CONSTRUCTION OF THE SUBWAYS LEADING FROM
THE CAPITOL TO THE SENATE AND HOUSE OFFICE BUILDINGS

PRESENTED BY

PRESLEY A. WEDDING

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SUMMARY

These subways are of that class of structures which grew out of the imagination of no one person. The construction of the House Office Building in its preliminary planning required a tunnel to convey power lines to the Capitol. Out of this original conception came into being the subways as they are today. Authorization for the construction of the two subways was made at different times, and on March 7, 1907, appropriation was made to enable work to be started upon them. Construction was begun a few days after June 14, 1907, and finished early in January 1908.

The structures are of reinforced concrete, being built in an open cut excavation. Their dimensions are: length 760', inside width 22', height 11'. Their courses follow sinuous paths from the northeast and southeast corners of the Capitol and enter the office buildings beneath their principal entrances.

It may be said that these subways serve a most unique purpose.

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Cities of the Ancient World were well supplied with tunnels, which were for the most part secret, and served no worthy use. Today, however, our great cities are honey-combed with tunnels supplying millions of people with a rapid means of transportation. Washington, the Capital of our Nation, is devoid of great underground systems found in other cities, but there is one subway structure of particular interest which will be the subject of this thesis, i.e., the subways which lead from the Capitol to the Senate and House Office Buildings.

The history of these subways is such an integral part of the history of the House Office Building especially, and the Senate Office Building to a lesser degree, that it is deemed necessary to go back into a brief history of these buildings in order that the desirability of the construction of such subways may be fully appreciated.

By the end of the nineteenth century the membership of the House of Representatives had grown to such an extent that the lack of office space became a serious problem. Offices in the Capitol itself were occupied by committee chairmen, occasionally the offices being shared with committee men themselves. As a result of this situation, Congressmen were forced to establish headquarters in hotels and private office buildings, which were scattered in many different parts of the city. This state of affairs created extreme inconvenience to the legislators because of the lack of proper office facilities, and the necessity of travelling between the Capitol and their several offices, especially at roll call. Hence, Congress, in order to meet this need, made the following appropriation in the Sundry Civil Appropriations Act of March 3, 1901:

"To enable the Architect of the Capitol to prepare and submit to Congress at its next session, plans, specifications, and estimates of cost for reconstructing and extending, in a fire-proof manner, the Capitol building, the renovation and decoration of the rotunda; also for the construction of a fire-proof building adjacent to the grounds of the Capitol building to be used for offices, storage, and power plant purposes connected with the Capitol building, One Thousand Five Hundred Dollars, to be immediately available."

Mr. Edward Clark, Architect of the Capitol at the time, prepared and submitted several preliminary plans for the structure later to be known as the House Office Building, but his death prevented his seeing any one of them through to completion. Upon his demise the burden of his duties fell to his assistant, Mr. Elliott Woods, who was later appointed to the office held by the late Mr. Clark, bearing the title of "Superintendent of the U. S. Capitol Building and Grounds."

It may be of interest at this point to note that the construction of the proposed subway was one of the considerations influencing the selection of the present site of the House Office Building instead of an alternate site on the property where the Labor newspaper building now stands, at 10 Independence Avenue, S. W. Mr. Woods, in a statement before the House Appropriations Committee in charge of Sundry Civil Appropriations for 1903, pointed out the fact that the construction of the subway would be much facilitated by the placing of the structure on its present site, since both the office building and the Capitol were on practically the same grade. He also pointed out the existence of a sewer line which would block the course of the subway to the alternate site. His estimate of the cost of the structure at the time was \$118,000.00.

It was originally planned to install in the new House Office Building a power, lighting, and heating plant sufficient to take care of that building and the Capitol, since those existing in the Capitol were rapidly becoming too antiquated for adequate service. Introductory remarks accompanying Mr. Wood's statement in the foregoing paragraph advised that a subway was necessary to carry the electric lighting, power, steam, and hot water systems and "at the same time it would be sufficiently comfortable as a public passage way and would be provided with means of transportation both for material and persons." From the preceding statements it is reasonable to believe that the purpose of the subway in its earliest conception was to carry utility lines to the Capitol from the proposed power plant in the new building. As plans were developed, however, the conception of the purpose of the subway was broadened to include that of providing a passage way between the Capitol and House Office Building.

The development of further plans and subsequent authorization of the construction of the Senate Office Building made apparent the fact that a central heating plant for the Capitol, Library of Congress, and the two proposed buildings was necessary. The realization of this project would, of course, obviate the necessity of the subway conducting power lines between the Capitol and House Office Building, but the idea of the subway affording a passageway for persons and materials remained, however, for Congress, in the Sundry Civil Appropriations Act of April 28, 1904, in addition to authorizing the construction of the Senate Office Building and central heating plant, made a provision for the construction of a subway, which reads as follows:

"Toward. . . .the installation of necessary machinery
for labor and material, construction of ducts, heating
mains, subways and traction system connection the
Capitol Building."

This plan of providing direct communication between the two buildings seemed to have met with approval of all concerned. The Urgent Deficiency Act of February 27, 1906, providing further funds for the Central Power Plant, at the same time authorized the construction of a subway to connect the Senate Office Building with the Capitol. The expenditure of such a structure was limited to \$168,500.00.

About one year later, on March 7, 1907, the following appropriation was made:

"To complete the construction of a building for a heating, lighting and power plant.....construction of ducts, heating mains, subways, and for all other appliances, and for each and every purpose in connection with all of the foregoing, One Million Two Hundred Thirty-Seven Thousand Dollars, to continue available until expended."

Of this sum \$337,000.00 was allotted to the construction of both subways.

After bids had been duly received and opened, the contract was awarded to the Rudolph S. Blome Company of Chicago, on June 14, 1907, and work was started shortly thereafter. The construction progressed satisfactorily, and the subways were finished early in January 1908.

The completion of the buildings and subways proved to be a great convenience to Congressmen. In addition to providing a comfortable way of communicating between the buildings in inclement weather, the subways had other advantages, as is intimated in a whimsical comment by the Washington Times of July 20, 1907:

"When the snow, sleet and ice is above ground, say the lawmakers, and a constituent standing guard at both the Capitol and office building doors, Representative Blank may whistle for his subway car, and like the Czar of

Russia when escaping from a bomb artist, go underground from office to Capitol and escape in safety to the floor of the House."

In fact, this system proved so popular that the Hon. Mr. Green of the House of Representatives, introduced on January 5, 1909, a resolution which was passed ordering the Superintendent of the U. S. Capitol Building and Grounds to investigate the feasibility of constructing subways between the office buildings, and extending the system to the Union Station, Government Printing Office, and proposed Post Office Building. Mr. Woods, in his report, recommended the carrying out of such a plan, stating that it was entirely feasible. For some reason this plan was not carried out.

Now that the subways were finished, means of transportation were taken under consideration. Specially designed electric automobiles built by the Studebaker Company were the first conveyors put into service. After a period of time, however, they proved rather slow transportation, and a rail system was studied. A scheme was presented whereby a tramway would be installed the route of which would include a complete circuit of the House Office Building, making stops especially at each corner of the building at the elevators. A similar arrangement in the Senate Office Building was prevented by the structure's "U" shape plan. (In recent years a fourth side has been added, making this plan symmetrical with that of the House Office Building.) The estimated cost of this entire system was \$75,000.00. The House rejected its portion of this system, and that subway has since been without means of transportation except ordinary hand cars for transporting materials. The Senate, however, because it was of smaller membership, and therefore would require a system of lesser capacity and expense, authorized installation of a system of transportation as provided for in the Sundry Civil Appropriations Act of March 4, 1911, between the Senate Office Building and the Capitol. At this time the head of the

Columbia Construction Company brought to the attention of the Senate, through the Architect of the Capitol, a monorail system which he had developed. Ultimately the contract for installation of a system for transportation was awarded to this company, and installed shortly thereafter.

Soon after the cars were put into operation, repairs were necessary due to the general type of construction, although fundamentally the idea was sound. Maintenance costs began to run so high that Mr. Woods, who had proved himself to be very capable and versatile in other fields of endeavor, redesigned the cars and submitted his plans to the Navy Yard for manufacture. Since that time the cars have been improved upon as defects are revealed by wear, replacement parts being manufactured at the Navy Yard. Until the present time satisfactory service has been given by this system.

CONSTRUCTION AND EQUIPMENT: The course of the Senate subway starts at the northeast corner of the Capitol and following a sinuous path enters the office building at the corner of Delaware and Constitution Avenues. The center line follows the corner axis of the building from a point 100' out from the face, and enters the basement at the rotunda which provides a turn-around space for the subway monorail. The course of the House subway is essentially symmetrical, starting at the southeast corner of the Capitol.

The amount of the bid submitted by the Blome Company was \$164,800.00 for one subway, both subways, however, were included in the terms of the contract. Completion of the work five months after date of formal acceptance was required. A fine of \$100.00 for every secular day's delay was provided. The contractor was required to guarantee his work for two years after date of final payment. It was also stipulated that work be started simultaneously on both subways. The method of excavation was to be open cut rather than tunnelling, the depth of cut being from 18' to 22' below the surface of the road way. Approximately 20,000 yds. of earth were excavated.

Alternate bids of brick and concrete were invited, and although prices on brick construction were somewhat lower, concrete was selected as the structural material. The typical section is 22' wide inside, wall to wall, widening to approximately 25' at the Capitol stations, being 11' high in the clear. The roof is 2'-6" thick in the center, tapering off to 1'-10" on each side, reinforced with 1-1/8" round rods and stirrups. Walls and floor, exclusive of track foundation, are 1'-3" thick reinforced with 3/4" round rods. A side walk 7' wide on one side is provided under which are placed vitrified clay ducts for service wires. Exterior of walls and roof are protected by water-proofing which, during back-filling, was protected on the roof by a layer of common brick placed flat. Back filling was to be properly rammed and rolled so that resurfacing of the streets could take place immediately upon completion. Special reinforcement under street car tracks was provided by a series of 20" I beams-- 80 lbs./ft., placed transversely across the roof 2' on centers at the center of the subway. Sixteen beams were necessary for this purpose for the House subway and 46 for the Senate subway. The tracks over the Senate subway have since been removed. Under the steps to each office building a special beam and girder construction is provided in the roof to support the unusual load.

Forced draft ventilation was provided by fans. Recently, however, air conditioning equipment has been installed, making this equipment obsolete.

Covering the outside of the subway walls from foundation to roof is a thickness of 4 1/2" hollow brick to take care of seepage drainage. Resting on a projection of the foundation just outside of this brick covering is a 6" cast iron soil pipe which is connected every 50' by 4" soil pipe branches to the bottom of the hollow brick facing. These 6" pipes lead to the regular city drainage system. Drainage within the subway itself is provided by gutters and half "S" traps which lead from the gutters to the outer edge of the subway excavation at which point they are connected to the regular street drainage system,

special care being required for the passage of the drain pipes through the water-proofing.

Excerpts from the specifications for materials which may be of interest are as follows:

"All cement used in the work to be done under this contract shall be Portland cement of standard and well known brands, and must be equal in all respects to the requirements and tests called for in the standard method of testing and latest specifications for cement preparation by the American Society for Testing Materials. Tests were to be made by the Bureau of Standards at the expense of the U. S. Government.

"Sand is to be of first quality, clean, sharp washed river sand free from loam, mud, organic matter, or other impurities. The source of supply shall be subject to the approval of the Superintendent.

"Broken stone is to be of crushed granite limestone, or sound trap rock, screened to pass through a 1" x 1" mesh screen and over a $\frac{1}{4}$ " x $\frac{1}{4}$ " mesh.

"The steel shall have an ultimate strength of 60,000 lbs. to 70,000 lbs. per square inch and an elastic limit of not less than one-half the ultimate strength. It shall bend 180° with a diameter equal to the thickness of piece tested without fracture."

The concrete was specified to be 1:2:4 mix by actual measure, and instead of including the now familiar slump test requirement, the specifications stated that "The mix shall be just wet enough to quake when rammed." The drop from conveyor was limited to three feet, mixing by hand or machine being permitted. Continuous mixers, however, were not allowed. Cement finish and

mortar were of 1:3 mix.

The sidewalks were to conform with the District of Columbia Building Code.

Water-proofing was to be accomplished by application of four layers of "Hydrex" water-proof felt or its equal. It was to be cemented by hot elastic "Hydrex" compound.

CARS: The cars themselves have a capacity of eighteen passengers. They are driven by two $7\frac{1}{2}$ horse power motors, of 115 volts and 58 amperes, direct current. The control mechanism is placed in the middle of the car to facilitate easy reversal of motion with a maximum of efficiency.

There is an overhead track attached to the ceiling along which travels an overhead assembly containing balancing wheels, thrust wheels and electrical contacts serving the same purpose as a trolley. This overhead assembly is connected to the car itself by two hollow steel bars, which make sliding contact, conveying the electric cables from the overhead trolley to the motor to take care of the unevenness of the ceiling.

The car travels on two flange wheels along a light, single track, at a speed of 18 miles per hour. Their general appearance resembles that of the cars used on "scenic railways" of present day amusement parks.

However modest the subways may be in their structural size and importance, it may be safely said that they serve one of the most, if not the most, unique purpose of any in our country today.

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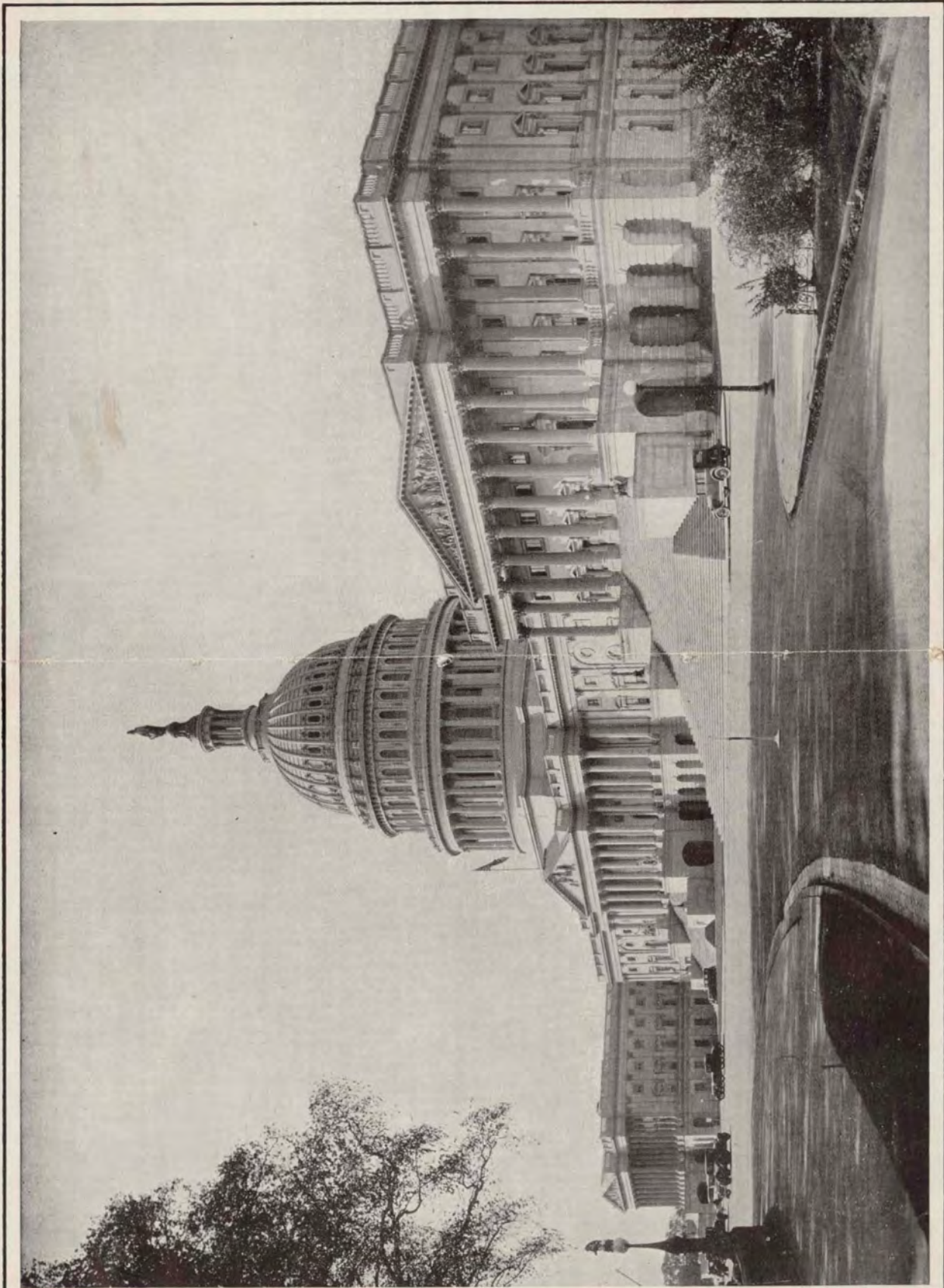
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THE UNITED STATES CAPITOL—EAST FRONT
Photo Copyright by Ridcutt



OFFICE BUILDING OF THE HOUSE OF REPRESENTATIVES.



SENATE OFFICE BUILDING.



View of the Subway Car



Capitol Station of the Senate
Subway



View Looking Down Straightaway



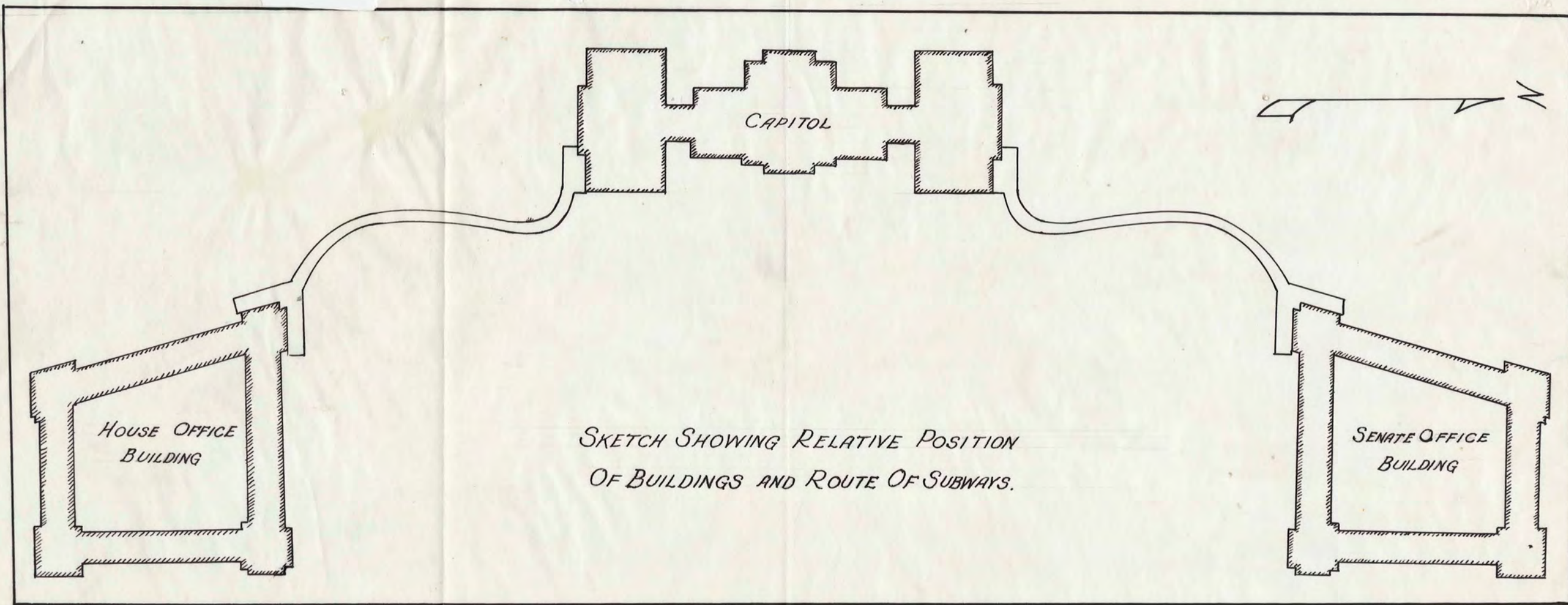
Beam and Girder Construction under Office Building Steps

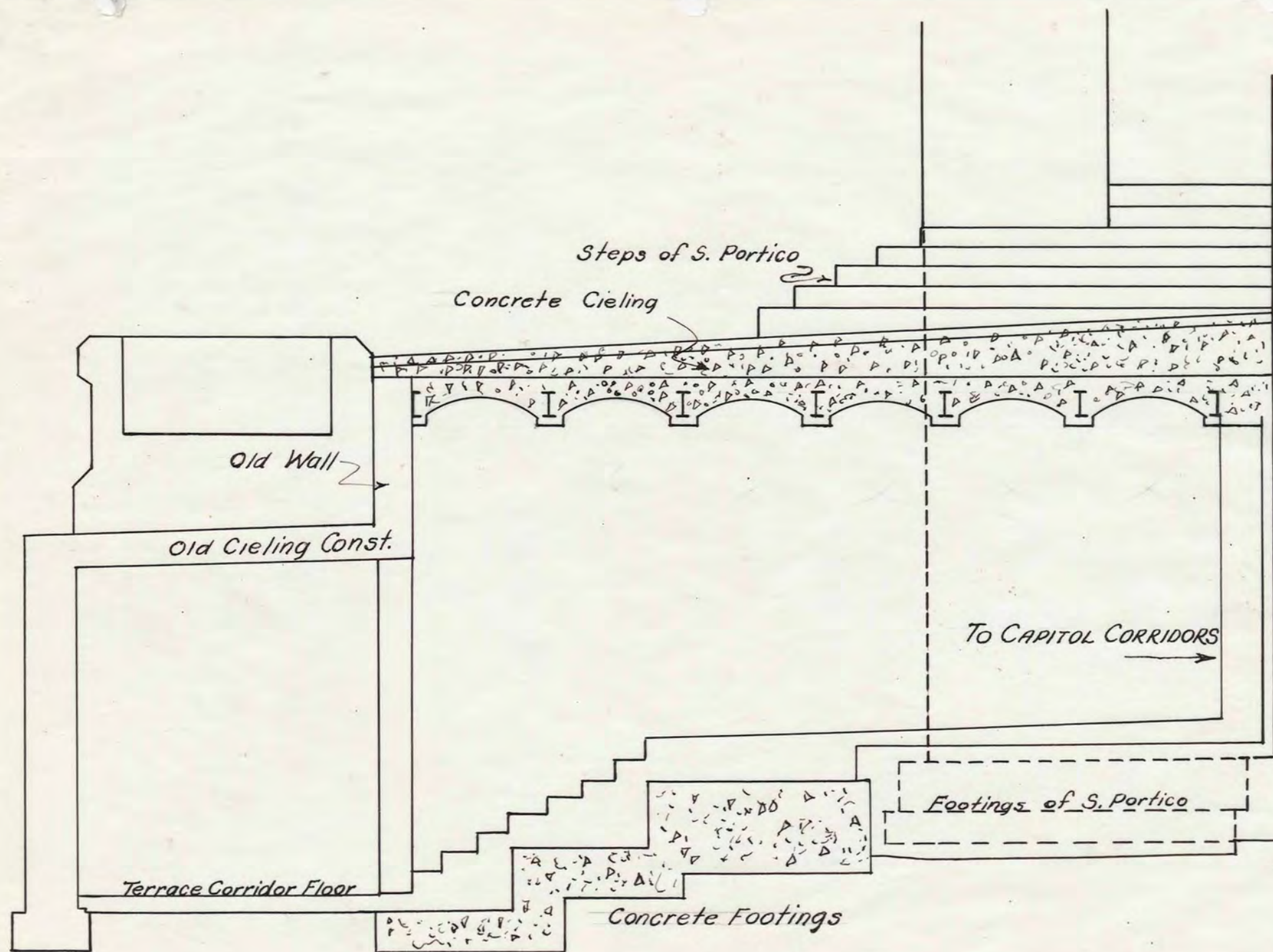


Opening to Fan Vault



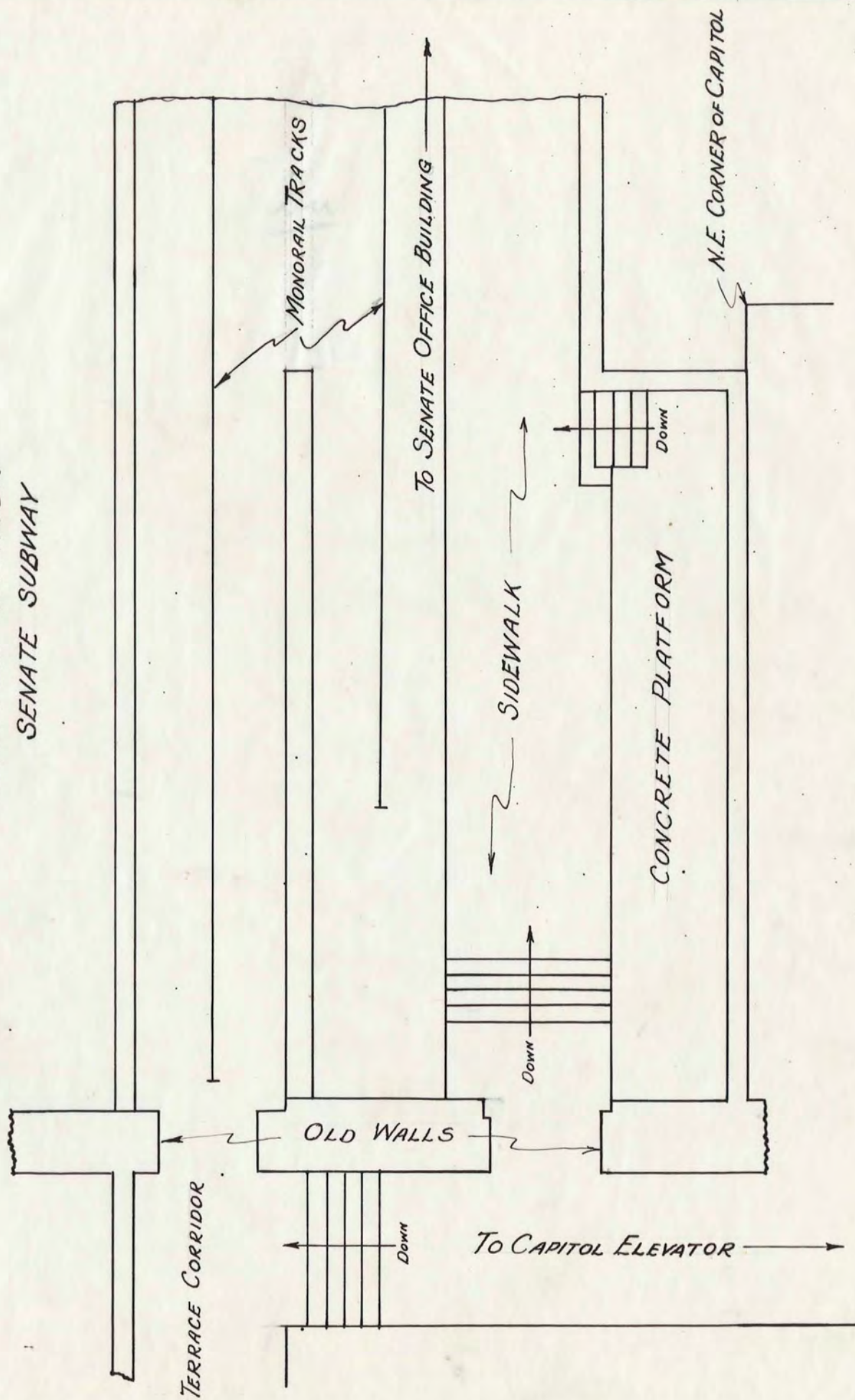
Portion of Rotunda in Senate
Building
Showing Beginning of Turn
Around and Overhead Construction

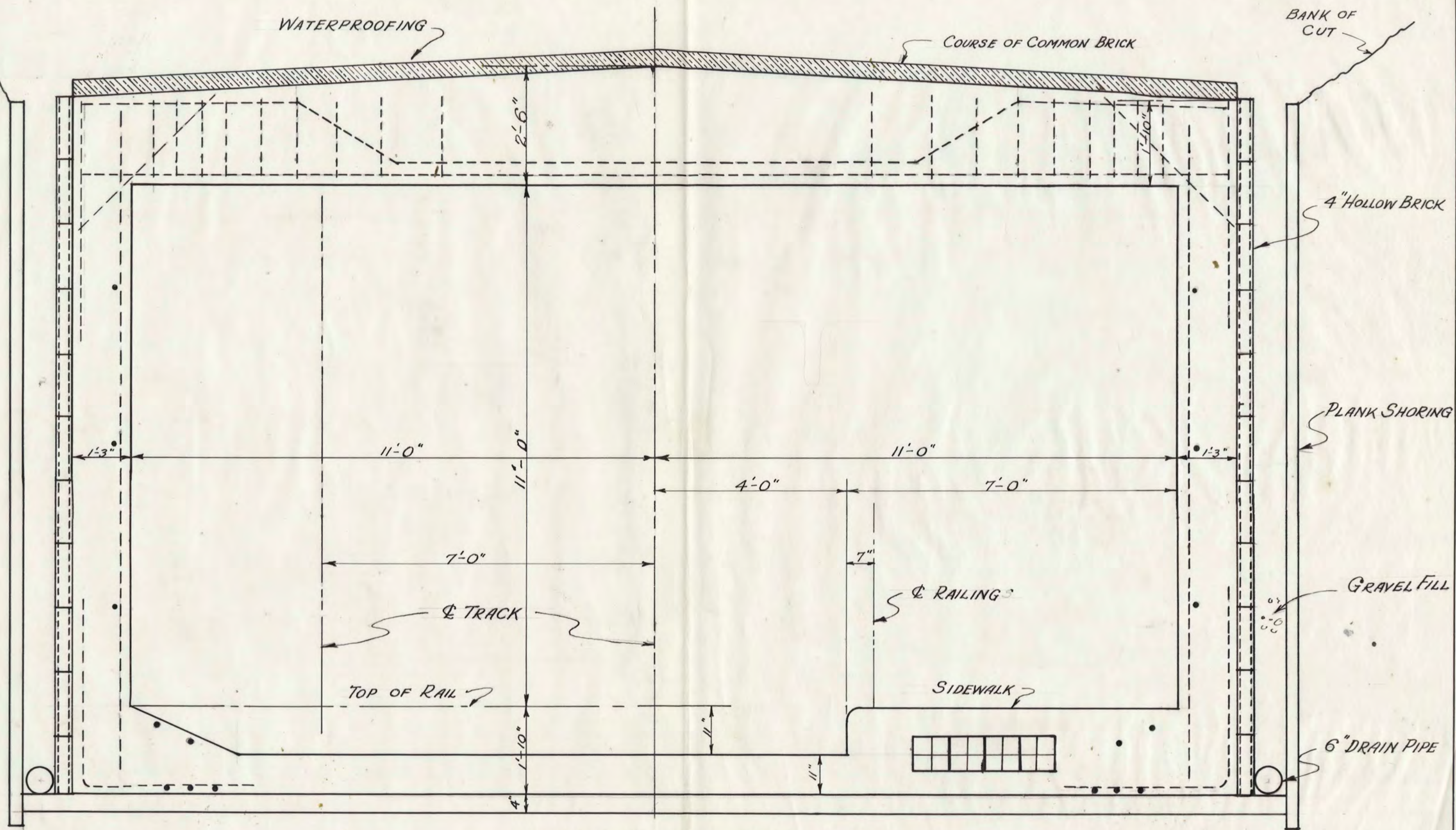




SECTION SHOWING END OF HOUSE SUBWAY AT CAPITOL (LOOKING WEST)
(Taken from original drawings)

CAPITOL STATION
SENATE SUBWAY





TYPICAL SECTION
 SHOWING REINFORCING
 SCALE 1" = 2'-0"